Agilent D6111 Dissolved Oxygen Probe
溶解氧电极

Operating Guide
用户手册

Agilent Technologies

Overview

The D6111 Dissolved Oxygen (DO) Probe can measure the dissolved oxygen concentrations in aqueous solutions. It is used with the 3200D Dissolved Oxygen Meter or 3200M Multi-Parameter Analyzer.

WARNING **Use this probe according to the operating manual to avoid personal injury.**

WARNING **The probe solution can cause chemical burns or illness if it is taken orally or contacted by human skin. Use protective clothing or gloves to avoid contact. In case of contact, rinse contacted area with tap water or deionized water thoroughly.**

Specifications

Table 1 D6111 Dissolved Oxygen Probe specifications

Specification	Value
Temperature range	0 to 45 °C
Concentration range	0 to 20 mg/L
Body material	ABS
Probe diameter	12 mm
Probe length	120 mm
Cable interface	miniDin4
Cable length	1000 mm

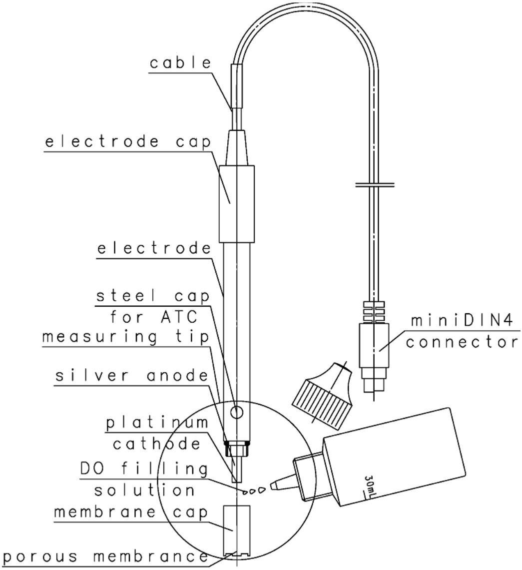

Figure 1 D6111 Dissolved Oxygen Probe assembly

Operation

Preparing the probe

1 Remove the probe membrane cap (5190-0548).
2 Rinse the inside and surface of membrane cap with distilled or deionized water and shake gently to dry.
3 Rinse the probe cathode and anode with distilled or deionized water and wipe them dry.
4 Add DO filling solution (5190-0547) to the membrane cap to 3/4 capacity.
5 Keep the probe membrane cap upright and and screw it slowly onto the probe body until finger tight.
6 Check that the membrane touches the cathode tip and there is no gas bubble or gap between the membrane and the cathode tip. If there is a gap or gas bubble between the membrane and the cathode tip, unscrew the membrane cap, add DO solution to the top, and reinstall the cap. Wipe the outside dry.

Polarizing the probe

1 Connect the probe to the meter and keep the meter at measuring state.
2 Expose the measuring tip to air or immerse the measuring tip into water saturated with air to polarize the probe.
3 For a new DO probe, a DO probe that has been refilled with new DO filling solution, or a DO probe that has been disconnected from the meter for more than 1 hour, polarize the probe for more than 1 hour. For a DO probe that has been disconnected from the meter for less than 1 hour, or if the meter has been idle for less than an hour, then polarize the probe for 25 minutes.

Calibration

Before measuring the sample solution, perform both a full scale calibration and zero oxygen calibration.

Full scale calibration

There are two methods of performing a full scale calibration. One method is with air for regular measurement. The other method is in water saturated with air at constant temperature for accurate measurement.

- To perform a full scale calibration with air:

1. Place the probe in air at constant flow and temperature.
2. Keep the membrane dry.
3. When the temperature reading and DO readings become stable, perform a full scale calibration according to the meter operating manual.

- To perform a full scale calibration in water saturated with air at constant temperature:

1. Soak the measuring tip in water saturated with air and wait until the temperature reading becomes stable.
2. Maintain a constant velovity by agitating the probe with a constant speed of 20–80 cm/s.
3. Ensure there are no air bubbles trapped on the membrane.
4. When the reading becomes stable, perform a full scale calibration according to the meter operating manual.

Zero oxygen calibration

1. Prepare zero-oxygen water by dissolving 12.5 g AR grade anhydrous sodium sulfite in 250 mL distilled or deionized water.
2. Soak the measuring tip in zero-oxygen water and gently shake the probe to remove bubbles on the gas permeation membrane surface.
3. When the DO reading becomes stable, perform a zero-oxygen calibration according to the meter operating manual.

Measurement

1. Rinse the measuring tip with distilled water or deionized water.
2. Soak the measuring tip completely in sample solution until the temperature reading becomes stable,
3. Maintain a constant velocity by agitating the probe with a constant speed of 20–80 cm/s.
4. Ensure there are no air bubbles trapped on the membrane.
5. Measure the temperature and DO value of sample solution according to the meter operation manual.
6. Rinse the probe measuring tip and wipe dry.

Operating hints

- The measuring tip is made of ABS plastic and porous membrane. Ensure the sample solution will not damage the measuring tip before measurement.
- The probe consumes oxygen near the gas permeation membrane during measurement. Gently shake the probe or stir the sample solution to maintain a constant oxygen concentration during measurement.
- Do not touch the gas permeation membrane.
- During measurement or transportation, white powder or crystals may form on the DO probe. This will not affect the performance of the probe. Rinse away the crystals with tap or deionized water.
- Press the gas permeation membrane tightly against the tip of the cathode without bubbles or gaps to maintain measuring accuracy. If the membrane is damaged or dirty, replace it with a new probe membrane cap.
- Replace the DO filling solution frequently, depending upon the service condition of the probe. If the probe is used frequently, replace DO filling solution weekly.
- Do not apply force onto the probe cap, cable, or cable interface.
- Keep the cable interface dry.

Maintenance

1. Remove the probe membrane cap and wipe the cathode and anode dry.
2. Polish the cathode and anode gently with abrasive cloth.
3. Rinse the cathode and anode with distilled or deionized water.

Troubleshooting

Meters

Refer to the related section in the meter operating manual.

Probe

- DO reading is not stable.
  - **a** Check if the membrane cap is screwed tight. The membrane should touch the platinum tip and there should be no gas bubble between the membrane and platinum.
  - **b** Check whether the flow speed of solution is in the proper range.
  - **c** During calibration or measurement, wait until the temperature and DO meter reading reach equilibrium.
  - **d** Check whether there are air bubbles in the solution or there is an air bubble trapped on the membrane.
  - **e** Check the time since last refilling or maintenance. If necessary, perform maintenance or refill DO filling solution.
- Reading is drifting.
  - **a** If this happens for a new probe, just after maintenance, or if it has not been in use for a long time, perform more preconditioning.
  - **b** Check whether the temperature of solution is the same as indicated on the meter. If not, wait more time to reach temperature equilibrium.

- Error in reading.
    - **a** Not enough preconditioning.
    - **b** Check that the calibration of the probe was performed properly (see “Calibration” on page 7).
    - **c** Check the flow speed of the solution.
    - **d** Check that the sample solution does not contain too many bubbles. Bubbles affect probe measurement.
- Reading is always zero.
    - **a** Check that the probe is connected to the meter and the meter is on.
    - **b** Check that the volume of the DO filling solution is not too low.

For any other problems during probe use, contact your Agilent Technologies customer service representative.

Storage

Short-term storage

Soak the measuring tip in distilled water or deionized water.

Long-term storage

1. Unscrew the probe membrane cap and empty the DO filling solution.
2. Rinse the probe membrane cap, cathode, and anode of the probe with distilled or deionized water.
3. Gently shake the membrane cap to dry.
4. Wipe the probe cathode and anode to dry.
5. Screw the dry membrane cap onto the probe body.
6. Place the probe in the storage box and store at ambient temperature and dry conditions.

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概述

实验室用覆膜式极谱型溶解氧电极，用于测量水溶液样品中的溶解氧含量，与 3200D 或 3200M 仪器配套使用。

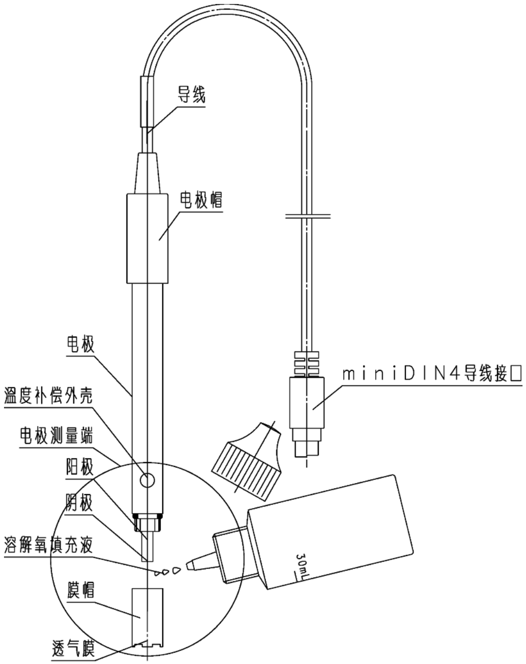
安全提示

1 按使用说明书使用电极。
2 电极附带的溶解氧填充液不宜口服或接触人体敏感器官，如意外接触，应立即用自来水或去离子水清洗。

技术参数

适用温度范围	0–45 °C
测量范围	0–20 mg/L
外壳材质	ABS
导线接口	mini DIN4
电极直径	12 mm
电极长度	120 mm
导线长度	1000 mm

电极插图



使用步骤

电极准备

1 将电极膜帽 （5190-0548）旋下，用蒸馏水或去离子水冲洗膜帽内部及表面，然后甩干。

2 用蒸馏水或去离子水冲洗电极阴极、阳极表面，然后擦干。

3 向电极膜帽内注入溶解氧填充液 （5190-0547）至电极膜帽四分之三高度左右。

4 保持电极膜帽开口向上，缓慢旋紧于电极外壳上。

5 检查电极阴极的顶部与电极膜帽上的透气膜完全接触无隔层、气泡。

6 冲洗并擦去旋紧电极膜帽时溢出的溶解氧填充液。

电极极化

1 将电极与仪器连接，使仪器处于测量状态。

2 将电极放置于空气中或使电极测量端浸没于饱和溶解氧水中，电极即开始极化。

3 如果更换溶解氧填充液、仪器未处于测量状态以及电极与仪器断开连接超过 1 h，则电极需要极化 60 min ；如果仪器未处于测量状态或电极与仪器断开连接未超过 1h，则电极需要极化 25 min。

电极标定

使用电极测量被测溶液前，电极需要进行满度标定和零氧标定。

满度标定

有两种方法可以进行电极满度标定：在空气中进行满度标定，适合一般测量的用户；在温度恒定的饱和溶解氧水中进行满度标定，适合精确测量的用户。

空气中进行满度标定

1 将电极置于无明显气流波动和温度波动的空气中。

2 检查透气膜表面无明显水迹附着。

3 待仪器的温度读数以及溶解氧读数稳定后，按照仪器说明进行电极满度标定。

温度恒定的饱和溶解氧水中进行满度标定

1 将电极测量端完全浸没于饱和溶解氧水中，等待仪器的温度读数稳定。

2 以 （20–80） cm/s 的速度水平摆动电极或使用搅拌器使饱和溶解氧水具有一定的流速 （使用搅拌器时，应轻微晃动电极以去除透气膜表面附着的气泡），待仪器的溶解氧读数稳定后，按照仪器说明进行电极满度标定。

零氧标定

1 将12.5 g分析纯无水亚硫酸钠溶解于250 mL蒸馏水或去离子水中，配制成无氧水。

2 将电极测量端浸没于无氧水中，轻微晃动电极以去除透气膜表面附着的气泡。

3 待仪器的溶解氧读数稳定后，按照仪器说明进行电极零氧标定。

测量被测溶液的温度值和溶解氧值

1 使用蒸馏水或去离子水冲洗电极测量端。

2 将电极测量端浸没于被测溶液中，等待仪器的温度读数稳定。

3 以 （20–80） cm/s 的速度水平摆动电极或使用搅拌器使被测溶液具有一定的流速 （使用搅拌器时，应轻微晃动电极以去除透气膜表面附着的气泡），按照仪器说明进行温度值和溶解氧值的测量。

4 测量完毕，冲洗电极测量端并擦干。

储存方法

短期存放

将电极测量端浸于蒸馏水或去离子水中。

长期存放

1 旋下电极膜帽，甩干电极膜帽内的溶解氧填充液，然后用蒸馏水或去离子水冲洗膜帽内外以及电极的阴极、阳极。
2 甩干电极膜帽附着的水迹，擦干电极的阴极和阳极。
3 将电极膜帽旋在电极外壳上，将电极放回电极包装盒内，室温干燥保存。

注意事项

- 电极测量端的主要材料为 ABS 塑料和透气膜，测量前应确认被测溶液不会对电极测量端造成损伤。
- 电极处于测量状态时会消耗透气膜周围的氧气，因此电极测量端处于水溶液中时，需要通过水平摆动电极或搅拌水溶液的方法补充透气膜附近的氧气含量。
- 电极的透气膜不能受到任何损伤，应尽量避免碰触电极的透气膜。
- 电极的透气膜应与电极阴极的顶部完全接触无隔层、气泡，否则会影响电极的测量准确度。如果膜损坏或有杂物附着，应及时更换新的电极膜帽。
- 在使用或储运过程中，电极上可能有少量白色粉末或晶体附着，这是由于部分渗出的溶解氧填充液失去水分引起，可用自来水或去离子水冲洗去除，不影响电极的性能。
- 溶解氧填充液使用一段时间后需要更换，溶解氧填充液的更换频率与电极的使用状况有关。如果电极频繁使用，建议用户每周更换一次溶解氧填充液。
- 电极帽、导线以及导线接口部分应避免受力，以免损坏。
- 导线接口必须保持干燥。

电极维护

1 将电极膜帽旋下，擦干电极阴极和阳极。
2 用细砂皮轻轻打磨电极的阴极和阳极。
3 用蒸馏水或去离子水冲洗电极的阴极和阳极并擦干。

疑难解答

电极使用中发现异常情况，请按下列步骤查找原因。

仪器

参看仪器说明书的相关部分

电极

仪器溶解氧读数上下跳动，不稳定。

- 检查膜帽是否旋紧，透气膜应与电极阴极的顶部完全接触无隔层、气泡。
- 电极测量端处于水溶液中时，需要通过水平摆动电极或搅拌水溶液的方法补充透气膜附近的氧气含量，参见“ 电极标定 ”相关内容。
- 电极进行标定或测量时，应等待仪器的温度和溶解氧读数稳定后再进行仪器的相关操作。
- 电极透气膜是否破损。
- 对电极进行维护，参见“ 电极维护 ”相关内容。

仪器溶解氧读数处于飘移状态

- 电极极化时间不足。
- 电极进行标定或测量时，应等待仪器的温度和溶解氧读数稳定后再进行仪器的相关操作。
- 电极透气膜是否破损。

测量不准确

- 电极极化时间不足。
- 电极未正确进行标定或标定时环境条件未满足电极标定要求，参见“ 电极标定 ”相关内容。
- 电极测量端处于水溶液中时，需要通过水平摆动电极或搅拌水溶液的方法补充透气膜附近的氧气含量，参见“ 电极标定 ”相关内容。
- 被测溶液中含较多气泡，影响电极测量。
- 更换电极膜帽以及溶解氧填充液。

- 对电极进行维护，参见 “ 电极维护 ” 相关内容。

仪器读数为零

- 检查电极是否与仪器连接。
- 更换溶解氧填充液。

如在电极使用过程中有其他疑问，请联系售后服务部门。

如需购买，请与安捷伦经销商联系或者登陆安捷伦官方网站。

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Printed in China 03/2012
First edition, March 2012

5973-1785

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